

LENS BLANK ALIGNMENT AND BLOCKING DEVICE AND METHOD

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application is related to an application entitled "A System and Method for Aligning Reference Marks on A Lens Blank Using Adjustable Alignment Marks" filed concurrently herewith, assigned Ser. No. _____, and assigned to the assignee of the present application. The disclosure of this application is hereby incorporated by reference.

FIELD OF THE INVENTION

[0002] The present invention is directed toward a device and method facilitating the alignment of a lens blank with a lens block, and, more specifically, toward a device and method facilitating the alignment of a lens blank with a lens block through use of a display screen that displays alignment markings and a projector that projects an image of a lens blank against the display screen so that, by aligning the image of the lens blank with the alignment markings on the display, the lens blank can be properly positioned for blocking and thereafter blocked.

BACKGROUND OF THE INVENTION

[0003] An ophthalmic lens blank requires certain processing before it can be fitted into a frame. Specifically, after a lens blank has been formed with the optical properties desired, it must be edged to a size and shape appropriate for a given frame to ensure a good fit with the frame. However, the optical properties of lens blanks are not uniform over their surfaces. The variation in optical properties depends in part on the type of lens blank, e.g. single vision, multi-focal, so-called progressive designs, and a variety of other factors. It is therefore important that a lens blank be properly positioned before it is edged to its final shape to ensure that necessary areas of the finished lens will be aligned with a user's eye when the lens is mounted in a frame. Even small errors in alignment can significantly degrade the quality of a lens and degrade the quality of a patient's corrected vision.

[0004] Before a lens can be edged, it is generally attached to a mount or a "block" in a process often referred to as "blocking." Once the lens has been blocked, the block carrying the lens is placed in a chuck in an edging machine so as to hold the lens in a predetermined orientation with respect to the edging machine. Various devices are known in the prior art for blocking lenses. Most such devices require a user to have a certain degree of skill in order to properly align reference markings on the lens blank with alignment markings on a lens blocker and to hold the blank in position while a lens block is attached to the blank. Prior art lens blocking devices are shown, for example, in U.S. Pat. No. 5,505,654 to Wood, U.S. Pat. No. 5,721,644 to Murray, U.S. Pat. No. 5,720,647 to Gottschald and U.S. Pat. No. 6,056,633 to Sesena, the disclosures of which are hereby incorporated by reference.

[0005] In one of these prior art devices, shown in U.S. Pat. No. 5,505,654 to Wood, a lens blank **14** is supported over a display screen **5**, which may be an LCD, on which various data concerning the lens are displayed. A diffusing surface **37**, comprising frosted Mylar film, is mounted over the

display screen. A light source **34** shining down on the lens from above forms a shadow of the lens blank on the diffusing surface, and this shadow, superimposed on the data from display screen **5**, is reflected off a series of mirrors and projected through a front viewing port **30**. However, the quality of the LCD image may be diminished after being reflected several times, and the arrangement of mirrors presents a user with a virtual image of the lens blank—an image that appears to be as far away from the user's eyes as the entire optical path length from the diffusing surface to the user's eyes. Moreover, the mirrors invert the image of the lens. This means that when a user moves the lens blank to the left in order to align it with reference markings, the reflected image of the lens blank will move to the right. Movement of the lens blank toward and away from the user will also be reversed. While operators with experience can learn to work with such a system, it can be difficult for novices or infrequent users to use.

[0006] Lens blockers are often operated by staff who are not trained in the inner workings of the device. Thus, if the blocker malfunctions, it is generally necessary to contact a technician. Even changing the lamp in a typical lens blocker may be beyond the skill of the average operator. Thus, for example, if the lamp in the blocker burns out, the blocker will not be usable until a technician arrives to correct the problem. If this occurs when a technician is not readily available, the blocker may be out of service for hours.

[0007] It is therefore desirable to provide a lens alignment system for a lens blocker that 1) presents a non-inverted image of a lens blank to a user, 2) that includes a directly viewable display screen rather than screen that is only viewable in reflection 3) that presents a viewer with a real image of a lens blank and lens support rather than a virtual image and 4) that includes a mechanism for replacing a burned out lamp that is easy to operate and that does not require access to the interior of the blocker.

SUMMARY OF THE INVENTION

[0008] These difficulties and others are addressed by the present invention, which, in a first aspect, comprises an alignment device having a light source, a first mirror and a stage, disposed between the light source and the first mirror, for supporting an object such that an image of an object supported on the stage is reflected by the first mirror. A screen is also provided on which a processor generates images. A second mirror is arranged to receive the image reflected from the first mirror and project the image of an object on the stage onto the screen. In this manner, the generated image on the screen is combined with the image of the object on the stage that is projected onto the screen.

[0009] In another aspect, the invention comprises a lens blocking device having a frame, a light source mounted on the frame, and a carriage having a first end and a second end mounted on the frame for sliding movement between first and second positions. A first mirror is mounted on the carriage first end and a lens block holder is mounted on the carriage second end. The block holder is shiftable between third and fourth positions with respect to the carriage. A stage for supporting an object is located between the light source and the carriage, which stage includes an opening. An at least partially translucent screen generating a display image is operably connected to the support frame. At least